Claims

What is claimed is:

1. A method for transparently transporting data comprising:
   converting a first data stream in a first format to a second data stream in a second format;
   transporting the second data stream over a transport medium; and
   converting the second data stream to a third data stream in the first format, wherein the third data stream has a substantially identical bit sequence and substantially identical timing as the first data stream.

2. The method of claim 1 wherein converting the first data stream to the second data stream comprises periodically determining a data rate for the first data stream and inserting the data rate in the second data stream.

3. The method of claim 2 wherein the data rate is determined by counting a number of bits of the first data stream which are counted in a predetermined interval.

4. The method of claim 2 wherein converting a first data stream in a first format to second data stream in a second format further comprises formatting the second data stream in a plurality of frames.

5. The method of claim 2 wherein converting a first data stream in a first format to second data stream in a second format further comprises formatting the second data stream in a plurality of packets.

6. The method of claim 2 wherein converting the second data stream to the third data stream comprises extracting the data rate from the second data stream and generating the third data stream at the same data rate.

7. A system for transparently transporting data comprising:

an ingress module configured to convert a first data stream to an second data stream,

wherein the ingress module comprises

an ingress buffer configured to store the first data stream,

an ingress counter configured to count the bits of the first data stream which are stored in the ingress buffer,

an ingress timer, and

write logic coupled to the ingress counter and the ingress timer and configured to determine the data rate of the first data stream, wherein the write logic is further configured to periodically write the data rate of the first data stream into the ingress buffer;

an egress module configured to receive the second data stream and to convert the second data stream to a third data stream, wherein the egress module is configured to reproduce the bit sequence and timing of the first data stream in the third data stream,

wherein the egress module comprises

an egress buffer configured to store the second data stream,

a phase locked loop (PLL) configured to control the rate at which data is read out of the egress buffer to produce the third data stream,

an egress counter configured to count the bits of the third data stream,

timing logic coupled to the egress counter and the egress timer and configured to determine the data rate of the third data stream and to control the PLL to match the data rate of the third data stream to the data rate of the first data stream; and

a transport medium coupled between the ingress module and the egress module and configured to convey the second data stream from the ingress module to the egress module.

8. The system of claim 7 wherein the timing logic is configured to determine a difference between the data rate of the first data stream and the data rate of the third data stream, and wherein the timing logic is configured to increase the frequency of the PLL if the data rate of the first data stream is greater than the data rate of the third data stream and to decrease the frequency of the PLL if the data rate of the first data stream is less than the data rate of the third data stream.

9. The system of claim 7 wherein the ingress module is configured to transmit a clock signal with the second data stream, wherein the ingress module is configured to determine the data rate of the first data stream based upon the clock signal, and wherein the egress module is configured to determine the data rate of the third data stream based upon the clock signal.

10. The system of claim 7 wherein the first data stream is an optical data stream, the second data stream is an electrical data stream, and the third data stream is an optical data stream, wherein the ingress module further comprises an optical-to-electrical converter and wherein the egress module further comprises an electrical-to-optical converter.

11. A method for transparently transporting optical data over an electrical medium comprising:

    converting a first optical data stream to an electrical data stream;

    transporting the electrical data stream over an electrical transport medium; and

    converting the electrical data stream to a second optical data stream, wherein the second optical data stream matches the first optical data stream.

12. The method of claim 11 wherein converting the first optical data stream to the electrical data stream comprises altering the bit sequence of the first optical data stream and formatting the resulting bit sequence for transport over the electrical transport medium, and wherein converting the electrical data stream to the second optical data stream comprises unformatting the electrical data stream and altering the resulting bit sequence of the electrical data stream to match the bit sequence of the first optical data stream.

13. The method of claim 11 wherein the electrical transport medium comprises an switching matrix.

14. The method of claim 13 wherein the electrical network comprises one or more routing devices configured to selectively route the electrical data stream to one of a plurality of potential destination devices.

15. The method of claim 11 further comprising controlling the timing of the second optical data stream to reproduce the timing of the first optical data stream.

16. The method of claim 15 wherein controlling the timing of the second optical data stream comprises adjusting the frequency of a phase locked loop configured to control the data rate of the second optical data stream.

17. The method of claim 11 wherein the bit sequence and timing of the second optical data stream matches the bit sequence and timing of the first optical data stream.

18. The method of claim 11 further comprising determining a count of bits per time interval in the first optical data stream and using the count of bits per time interval to reconstruct the timing of the second optical data stream.

19. The method of claim 18 further comprising inserting the count of bits per time interval in the electrical data stream.

20. The method of claim 11 further comprising generating an internal clock signal, transporting the internal clock signal with the electrical data stream over the electrical transport medium and determining data rates associated with the first and second optical data streams based upon the internal clock signal.

21. The method of claim 11 further comprising providing an external clock signal and determining data rates associated with the first and second optical data streams based upon the external clock signal.

22. The method of claim 11 wherein converting the first optical data stream to the electrical data stream comprises storing data bits corresponding to the first optical data stream in an ingress buffer, counting the number of bits per time interval which are stored in the ingress buffer, storing the number of bits per time interval in the ingress buffer and reading the databits and corresponding number of bits per time interval out of the ingress buffer; and wherein converting the electrical data stream to the second optical data stream comprises extracting the number of bits per time interval from the electrical data stream, storing the remaining databits corresponding to the electrical data stream in an egress buffer, reading databits out of the egress buffer, counting the number of bits per time interval which are read out of the egress buffer, and adjusting the rate at which databits are read out of the egress buffer to cause the number of bits per time interval read out of the egress buffer to match the number of bits per time interval extracted from the electrical data stream.

23. A system for transparently transporting optical data over a electrical medium comprising:

an ingress module configured to convert a first optical data stream to an electrical data stream;

an egress module configured to receive the electrical data stream and to convert the electrical data stream to a second optical data stream; and

wherein the egress module is configured to reproduce the bit sequence and timing of the first optical data stream in the second optical data stream.

24. The system of claim 23 further comprising an electrical transport medium coupled between the ingress module and the egress module and configured to convey the electrical data stream from the ingress module to the egress module.

25. The system of claim 24 wherein the electrical transport medium comprises a switching matrix.

26. The system of claim 23 wherein the ingress module comprises an optical-electrical converter configured to convert the first optical data stream to the electrical data stream, a buffer configured to store the electrical data stream, and a counter configured to count the bits of the data stream which are stored in the buffer.

27. The system of claim 26 further comprising timing logic coupled to the counter and configured to determine the number of bits of the data stream which are stored in the buffer during each of a first plurality of regular intervals.

28. The system of claim 27 wherein the timing logic is configured to store a number of counts per interval corresponding to the electrical data stream in the buffer.

29. The system of claim 28 wherein the ingress module is configured to convey the data stream and the corresponding number of counts per interval to the egress module.

30. The system of claim 23 wherein the egress module comprises a buffer configured to store the electrical data stream, a phase locked loop (PLL) configured to control the rate at which data is read out of the buffer, a counter configured to count the bits of the data stream which are read out of the buffer, and an electrical-optical converter configured to convert the bits of the data stream which are read out of the buffer to the second optical data stream.

31. The system of claim 30 further comprising timing logic coupled to the counter and configured to determine the number of bits of the data stream which are read out of the buffer during each of a second plurality of regular intervals.

32. The system of claim 31 wherein the timing logic is coupled to the PLL, wherein the timing logic is configured to determine a difference between the number of bits of the data stream which are stored in the buffer during one of the intervals and the number of bits of the data stream which are read out of the buffer during one of the intervals, and wherein the timing logic is configured to increase the frequency of the PLL if the number of bits of the data stream which are stored in the buffer is greater than the number of bits of the data stream which are read out of the buffer and to decrease the frequency of the PLL if the number of bits of the data stream which are stored in the buffer is less than the number of bits of the data stream which are read out of the buffer.

33. The system of claim 23 wherein the ingress module is configured to transmit a clock signal with the electrical data stream and wherein the ingress module and egress module are configured to determine the regular intervals based upon the clock signal.

34. The system of claim 23 wherein the ingress module and egress module are configured to determine the regular intervals based upon an externally-supplied clock signal.

35. A system for transporting optical data over a electrical medium comprising:

a first data transport path, wherein the first data transport path comprises

a first ingress module configured to convert a first optical data stream to a first electrical data stream,

a first transmission medium coupled to the first ingress module and configured to transport the first electrical data stream, and

a first egress module configured to receive the first electrical data stream from the first transmission medium and to convert the first electrical data stream to a second optical data stream, wherein the first egress module is configured to reproduce the bit sequence and timing of the first optical data stream in the second optical data stream; and

a second data transport path, wherein the second data transport path comprises

a second ingress module configured to convert a third optical data stream to a second electrical data stream,

a second transmission medium coupled to the second ingress module and configured to transport the second electrical data stream, and

a second egress module configured to receive the second electrical data stream from the second transmission medium and to convert the second electrical data stream to a fourth optical data

stream in a manner which produces a bit sequence in the fourth optical data stream which differs from the third optical data stream.